REMARKS

Claim 1 has been amended. Claims 9 and 10 have been cancelled without prejudice.

The Examiner has rejected claims 1-4, 9 and 10 under 35 U.S.C. 103(a) as being unpatentable over Applicant Admitted Prior Art ("AAPA") in view of Shimoyama et al. (US Patent 5,355,164) ("Shimoyama") and further in view of Tetsuji et al. (JP 4-37166) ("Tetsuji"). In rejecting claim 1, the Examiner has noted that claim 1 is presented using the phrase "adapted to" which is non-limiting and, therefore, the Examiner has not been given patentable weight to those limitations presented with this phrase during examination of the claims on their merits. Applicant has amended independent claim 1, and with respect to this claim, and its dependent claims, the Examiner's rejections are respectfully traversed.

Applicant has amended independent claim 1 to recite an image sensing apparatus using an image sensing element which has a plurality of pixels arrayed in horizontal and vertical directions, wherein the image sensing element includes an effective pixel area which outputs signal of an object image, a first reference pixel area which outputs a first reference signal, and a second reference pixel area which outputs a second reference signal, wherein a pixel in the first reference pixel area is shielded from light and does not have a photoelectric conversion element, and wherein a pixel in the second reference pixel area is shielded from light and has a photo-electric conversion element and outputs a signal including dark current component generated in the photoelectric conversion element, said image sensing apparatus comprising a first correction unit <u>that corrects</u> signals of the effective pixel area by subtracting the first reference signal from each horizontal line signal of the effective pixel area with respect to each corresponding horizontal line, and a second correction unit <u>that uniformly corrects</u> signals of

the <u>entire</u> effective pixel area, which are corrected by said first correction unit, by evenly

subtracting a representative value, which is based on the second reference signal, from the

signals of the plurality of horizontal lines of the effective pixel area.

Applicant has amended independent claim 1 to remove the recitations "adapted to," and

believes that amended independent claim 1 now positively recites the features of the first and

second correction units without using language that suggests an intended use. Therefore,

applicant submits that all limitations recited in amended claim 1 should be given patentable

weight during examination of the claims on their merits, including the features of the first and

second correcting units.

The present invention recited in amended independent claim1 is not taught or suggested

by the cited art of record. More particularly, neither AAPA, Shimoyama nor

Tetsuji, independently or in combination, teach or suggest <u>a second correction unit that</u>

<u>uniformly corrects signals of the entire effective pixel area, which are corrected by the first</u>

<u>correction unit, by evenly subtracting a representative value which is based on the second</u>

<u>reference signal, the second reference signal being an output signal including dark current</u>

<u>component generated in the photo-electric conversion element connected to the second pixel</u>

<u>area that is shielded from light.</u>

AAPA discloses an image sensing element 100 including an effective pixel region 1a,

a horizontal optical black region 6 which is shielded from light, a horizontal transfer portion 4

and a charge detection portion 5. See Fig. 7. In AAPA, the charge detection portion 5 converts a

signal charge to signal voltage, with the signal charge including signals photoelectrically

converted by photodiodes within the effective pixel region 1a and dark current component

signals generated within the optical black region 6. Page 3, Lines 18-25. AAPA further

discloses correcting of the signal charge for the dark current component using an analog

processing circuit 102, which includes a clamping circuit 103 for providing DC recovery by

clamping a DC component onto a signal that has been AC coupled via a capacitor 101. See,

FIG. 8. The DC component is an optical black signal derived from the horizontal optical black

region 6 of the image sensing element 100. Page 4, Lines 18-26. In AAPA, the clamping of the

DC component is executed for each row of the image sensing element 100. Page 5, Lines 14-

15.

Thus, AAPA discloses one correction unit, i.e. clamping circuit, which executes

correction on each horizontal line of an image on the basis of the value of the signal from the

corresponding horizontal line of photodiodes within the reference optical black region.

However, AAPA does not disclose a second correction unit that uniformly corrects signals of

the entire effective pixel area, which has been corrected by the first correction unit. Nor does

AAPA make any mention of correcting the signals of the entire effective pixel area by evenly

subtracting a representative value based on a reference signal from the second reference area

from the signals of a plurality of horizontal lines of the effective pixel area. Instead, in the

AAPA, the signals of each horizontal line of the effective pixel area are corrected based on a

value of the signal from the corresponding horizontal line in the reference area, and as a result

in AAPA, if the optical black signal within the reference optical black region varies due to light

shielding errors, then the signal correction will be varied on a horizontal line-by-line basis.

Accordingly, AAPA does not teach or suggest a second correction unit that uniformly

corrects signals of the entire effective pixel area, which are corrected by the first correction unit,

by evenly subtracting a representative value which is based on the second reference signal, the

second reference signal being an output signal including dark current component generated in

the photo-electric conversion element connected to the second pixel area that is shielded from light as recited in amended claim 1.

Shimoyama and Tetsuji also do not teach or suggest this feature. Shimoyama discloses a linear sensor (1) which includes blind pixels BC which do not have a sensing function disposed at both ends of the linear sensor, dummy pixels DC with a light blocking mask adjacent to the blind pixels BC and read pixels RP for reading the image. Col. 3, lines 45-53. Shimoyama teaches that dark current is measured using the dummy pixels and a read signal is corrected using the dark current. Shimoyama also teaches that signals of blind pixels are used as dark current correcting signals and that the average value of the blind pixels of a plurality of lines are used for correction, e.g. average value of blind pixels of five lines. Col. 3, lines 55 – Col. 4, line 12. However, in Shimoyama, the correction of the image data read out by the read pixels using the signals of blind pixels is performed on a line-by-line basis (See, Col. 2, lines 32-35), and there is no teaching of uniformly correcting the signals of the entire effective pixel area by evenly subtracting a representative value based on the second reference signal from the signals of the plurality of horizontal lines of the effective pixel area. Moreover, there is no mention in Shimoyama of performing the second correction of the image data, i.e. correction using signals of blind pixels, after the image data has been corrected by the first correction unit, i.e. correction using dummy pixels. Rather, Shimoyama teaches that the correction using signals of blind pixels is performed on signal from an image from the read pixels. See, Col. 3, lines 63-65.

The Tetsuji publication discloses a light sensor which includes a light receiving part 11, an effective pixel region I, a first optical black pixel region II having a pseudo light receiving part and light being blocked by light blocking film, a second optical black pixel region III

having no light receiving part and a third optical black pixel region having no light receiving part. Page 6 of translation of Tetsuji. Tetsuji also discloses that the corrected output of the optical signal output from the effective pixel region can be obtained using the outputs from the three optical black pixel regions. See, page 7 of translation of Tetsuji.

Thus, in Tetsuji, the correction is performed based on the outputs of all three black pixel regions using an equation for calculating the corrected output. However, there is no mention anywhere in Tetsuji of having a second correction unit uniformly correct signals of the entire effective pixel area which have bee corrected by the first correction unit. Moreover, the correction in Tetsuji is performed on a row-by-row basis, and there is no teaching of the second correction unit uniformly correcting signals of the entire effective pixel area by evenly subtracting a representative value which is based on the second value from the signals of the plurality of horizontal lines of the effective pixel area.
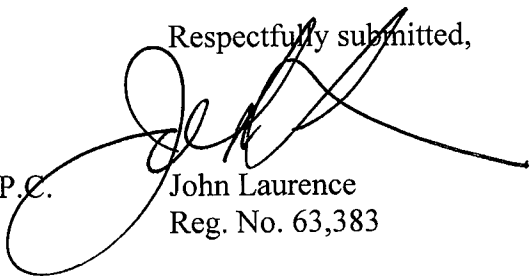
Accordingly, applicant's amended independent claim 1 which recites a second correction unit that uniformly corrects signals of the entire effective pixel area, which are corrected by the first correction unit, by evenly subtracting a representative value which is based on the second reference signal, the second reference signal being an output signal including dark current component generated in the photo-electric conversion element connected to the second pixel area that is shielded from light, and its respective dependent claims, patentably distinguish over the AAPA, Shimoyama, et al. and Tetsuji references, taken alone or in combination with one another.

In view of the above, it is submitted that Applicant's claims, as amended, patentably distinguish over cited art of record. Accordingly, reconsideration and allowance of the application and claims is respectfully requested.

Dated: July 15, 2009   Respectfully submitted,

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